SEPARABLE FIBROUS INSULATION

FIELD OF THE INVENTION

[0001] The present invention relates to building insulation, and more particularly to separable faced fibrous insulation.

BACKGROUND OF THE INVENTION

[0002] Insulation blankets formed from mineral fibers, very often fiberglass, are well known and have long been used for building insulation. A facing sheet, typically formed of Kraft paper, is often coated with a bituminous material, which provides a vapor retarder and adheres the facing sheet to the mineral fiber blanket . The facing sheet typically has edges which in their extended position project beyond the sides of the mineral fiber blanket for the purpose of securing the insulation in between wall studs, floor joists, roof rafters, and the like. The blanket is typically formed from glass fibers which are often bound together using a resinous material.

[0003] Generally, the insulation blankets are packaged in sizes conforming to standard sizes of structural framework building cavities formed by wall studs, roof rafters, and the like. For example, the typical spacing between many framing members used in residential houses is approximately 14 1/2 inches. Therefore, insulation blankets are normally manufactured to be about 15 inches in width so that they can be slightly compressed to fit snugly into the 14 1/2 inch spacing. However, in any installation job, there are usually several occurrences where the spacing between framing members will depart from the standard width. Where this occurs, an installer will typically cut the insulation blanket with a knife to the appropriate width to fit the nonstandard-sized cavity. Not only does this make the installation more labor intensive, but it also often results in gapping or otherwise improperly fitted insulation.

[0004] U.S. Patent No. 6,083,594 to Weinstein et al. discloses a pre-cut fibrous insulation blanket for fitting into nonstandard width cavities. The blanket has one or more longitudinally extending cuts which extend the length of the blanket and have a depth of greater than one half of the thickness of the blanket and less that the complete thickness of the blanket. The insulation

blanket may include a facing having perforated lines which extend along the longitudinal cuts and which, along with the longitudinal cuts, facilitate separation of the blanket along such cuts.

[0005] An improved separable insulation blanket is desired.

SUMMARY OF THE INVENTION

[0006] One aspect of the present invention is an insulation blanket which includes a fibrous insulation layer and a facing material. The fibrous insulation layer has at least one longitudinal cut which extends from a first major surface to a second major surface and forms adjacent layer sections. Each layer section has at least one inner sidewall. At least one inner sidewall of adjacent layer sections has applied thereto an adhesive for adhering it together with another adjacent layer section. The facing material has separation means which extends substantially along the at least one longitudinal cut. The facing material is applied to one or both of the first and second major surfaces of the insulation layer.

[0007] The separable insulation blanket of the present invention may be advantageously used to conform to various size cavities situate in the structural framework of buildings. The application of an adhesive to longitudinal cuts, which separate the insulation layer into sections, allows easy separation of the insulation, if needed, to fill non-standard sized cavities, while concurrently providing a way to prevent the insulation layer from gapping at the cuts when the insulation is not separated, thus helping to maintain the proper insulating R-value.

[0008] Another aspect of the present invention is a method of making a faced separable insulation blanket comprising a fibrous insulation layer having a first and second major surface, cutting the fibrous insulation layer into separate layer sections by making at least one longitudinal cut that extends from a first major surface of the insulation layer to a second major surface of the fibrous insulation layer, applying an adhesive to one or more inner sidewalls of the separate layer sections to glue the layer sections together, and applying a facing material to at least the first or second major surface of the fibrous layer. The facing material includes a separation means that is substantially aligned with the longitudinal cut.

[0009] A further aspect of the present invention is a method of insulating a cavity in a framework of a building comprising (a) providing an insulation blanket including (i) a fibrous insulation layer having a first major surface and a second major surface, and at least one longitudinal cut extending from the first major surface to the second major surface, the cut forming adjacent insulation layer sections each having at least one inner sidewall, wherein at least a first inner sidewall of a first insulation layer section has applied thereto an adhesive for adhering to an adjacent second inner sidewall of a second adjacent insulation layer section; and (ii) a facing material disposed on the first major surface, the facing material having a separation means which extends substantially along said at least one longitudinal cut; (b) separating the insulation blanket along at least one longitudinal cut of the fibrous insulation layer and the respective separation means of the facing material to form separate insulation blanket sections; and (c) inserting a first separate insulation blanket section into a non-standard sized cavity in the framework of the building.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] Figure 1 is a front perspective view of an exemplary embodiment of an insulation blanket having a perforated facing;

[0011] Figure 2 is an enlarged detail of the circled portion of Figure 1;

[0012] Figure 3 is an exploded view of the blanket of Figure 1;

[0013] Figure 4 is a front perspective view of an exemplary embodiment of an insulation blanket having overlapping facing sheets;

[0014] Figure 5 is a front perspective view of an exemplary embodiment of an insulation blanket having a facing with marking lines;

[0015] Figure 6A is a front perspective view of an exemplary embodiment of an insulation blanket having a separation means which includes an inner reinforcing strip;

[0016] Figure 6B is an enlarged detail of the circled portion of Figure 6A;

[0017] Figure 7 is a front perspective view of an exemplary embodiment of an insulation blanket having a separation means which includes a crease;

[0018] Figure 8A is a front perspective view of an exemplary embodiment of an insulation blanket having a separation means which includes a heat seal fin;

[0019] Figure 8B is an enlarged detail of the circled portion of Figure 8A;

[0020] Figure 9A is a front perspective view of an exemplary embodiment of an insulation blanket having a separation means which includes folded fin;

[0021] Figure 9B is an enlarged detail of the circled portion of Figure 9A;

[0022] Figure 10A is a front perspective view of an exemplary embodiment of an insulation blanket having a separation means which includes a crimp fold;

[0023] Figure 10B is an enlarged detail of the circled portion of Figure 10A;

DETAILED DESCRIPTION

[0024] This description of the exemplary embodiments is intended to be read in connection with the accompanying drawings, which are to be considered part of the entire written description. In the description, relative terms such as "lower," "upper," "horizontal," "vertical,", "above," "below," "up," "down," "top" and "bottom" as well as derivative thereof (e.g., "horizontally," "downwardly," "upwardly," etc.) should be construed to refer to the orientation as then described or as shown in the drawing under discussion. These relative terms are for convenience of description and do not require that the apparatus be constructed or operated in a particular orientation. Terms concerning attachments, coupling and the like, such as "connected" and "interconnected," refer to a relationship wherein structures are secured or attached to one another either directly or indirectly through intervening structures, as well as both movable or rigid attachments or relationships, unless expressly described otherwise.

[0025] FIG. 1 is a perspective view of an exemplary insulation blanket 10. The insulation blanket comprises a fibrous insulation layer 20 and a facing material 40. The fibrous

insulation layer 20 preferably comprises glass fibers, but may be formed of other mineral fibers, such as rock wool fibers, slag fibers, and basalt fibers, or organic fibers and polymer fibers, such as polyester, polypropylene or other thermosetting or thermoplastic resinous fibers, or combinations thereof. Preferably the fibrous layer includes a binder, such as, for example, phenol-formaldehyde resole resin–based binder, or other suitable bonding material, which binds together the fibers making up the blanket.

[0026] Preferably the thickness (T) of the layer 20 is approximately 3 1/2 inches (as shown in FIG. 1) for insulating 2x4 inch studs or framing members, or approximately 5 1/2 inches for insulating 2x6 inch studs or framing members. However, other thicknesses may be employed depending upon the amount of thermal resistance or sound control desired and the depth of the framing members being fitted with the insulating blanket. A preferable glass fibrous blanket has a glass fiber density of from about 0.3 to 1.5 pounds per cubic foot (4.8x10-3 g/cm3 to 2.4x10-2 g/cm3).

[0027] The length (L) of the insulation blanket 10 may vary according to the particular application for which such blanket is being used, but for typical applications, such as insulation for residential housing, the blankets will be approximately forty-six to forty-eight inches in length or approximately ninety-three to one hundred and five inches in length. The blankets 10 are preferably packaged as batts in such lengths, however they may also be packaged in the form of rolls (which may be 30 to 75 feet in length). The width (W) of the insulation blanket 10 may vary depending on the cavity width of the framing members or studs being insulated. For example, a preferred width is between about fourteen and one half and fifteen and one half inches, which corresponds to a standard cavity having a center to center spacing of the wood framing members at sixteen inches, a width of about sixteen inches, where the center to center spacing between steel studs is sixteen inches, or a width between about twenty two and one half to about twenty four inches (preferably twenty-three inches, twenty-three and a quarter inches, or twenty-four inches) where the center to center spacing between the wood or steel framing members is twenty-four inches.

[0028] Facing material 40, which is preferably coated with a bituminous material such as asphalt to provide an adhesive vapor retarder, is preferably a Kraft paper, but also may be a foil, such as aluminum foil, a foil-scrim-kraft (FSK) laminate, a polymeric film, or other facing material regularly used with insulation materials. The facing material 40 is bonded to one or more of the surfaces of the layer 20, as will more fully be discussed below.

[0029] Fibrous layer 20 includes a first (or top) major surface 22, a second (or bottom) major surface 24, and at least one longitudinal cut 26. The at least one longitudinal cut extends from the first surface to the second surface and for the length of the insulation blanket 10, separating the fibrous layer 20 into two or more layer sections 28. The cuts can optionally be perforated cuts, such as those produced by a water jet or perforated cutting wheel. FIG. 1 depicts an insulation blanket 10 having three longitudinal cuts 26a-c separating the layer 20 into four layer sections 28a-d.

[0030] Referring again to the embodiment shown in FIGS. 1 and 3, each of the layer 20 sections 28a-d have two sidewalls. The inner layer sections 28b, 28c have two inner sidewalls 30, each adjacent to an inner sidewall 30 of an adjoining layer section. The outer layer sections 28a, 28d, have an inner sidewall 30 and an outer sidewall 32, the inner sidewall 30 being adjacent to a sidewall 30 of an inner layer section and an outer sidewall 32 that forms a side surface of the insulation blanket 10. (Note that where the insulation blanket has only one longitudinal cut and therefore only two layer sections, both layer sections will be adjacent to only one other layer section.)

[0031] Referring to FIGS. 1 and 2, at one or more locations along the longitudinal cuts 26a-c, on one or both of the inner sidewalls 30 of adjacent layer sections 28a-d, an adhesive 34 is applied that serves to bond the adjacent layer sections together. (The volume of the adhesive 34 in FIG. 2 is exaggerated to enhance the detail. Preferably the adhesive 34 is applied in a thin strip to the inner sidewalls 30.) The adhesive 34 is preferably a hot melt glue, such as sold by Henkel America as Product No. 80-8273, but may include a variety of other adhesives as would be known in the art. The adhesive 34 is preferably applied at approximately a midpoint between the top and bottom major surfaces 22, 24 of the layer 20 extending the length of the longitudinal

cut 26 (as shown in FIG. 1), but may be placed at any location (or at a plurality of locations) along the inner sidewalls 30 of the layer sections 28. The adhesive 34 may be applied in a substantially straight line or in a different pattern, such as a figure eight (where the nozzles direct the adhesive in a circular pattern to an advancing section), for example. The adhesive 34 may be continuous along the length of the inner sidewalls or may be applied intermittently. Possible advantages for intermittently applying the glue may include cost savings and facilitation of easier separation of the layer sections. Preferably, the adhesive is applied using one or more spray nozzles, or applicators.

[0032] The adhesive bonds the adjacent layer sections 28 together while allowing for such sections 28 to be easily separated by an installer along the longitudinal cuts as needed to fit cavities having a non-standard width. Where no separation is needed, the adhesive maintains the insulation blanket 10 as a cohesive unit, with no adverse effect on the insulating R-value. While separation through the adhesive 34 is preferred, such is not required, and separation can occur in the insulation on either side of the adhesive 34, for example.

[0033] Facing material 40 includes separation means extending substantially along the longitudinal cuts 26 of the insulation blanket 10. Such separation means may include a variety of means for facilitating separation of the facing material 40 and blanket 10 along the longitudinal cuts 26. In one embodiment, as shown in FIGS. 1 and 3, the separation means may include a series of perforations 42 in the facing material 40 which are aligned with the longitudinal cuts 26. Preferably, the perforations 42 are small enough to permit the adhesive vapor retarder on the facing, e.g., asphalt, to fill in the perforations, thus providing a vapor retarder when the fibrous layer is not separated into sections at the longitudinal cut 26. In this embodiment, the facing material is preferably not pre-coated with the adhesive vapor retarder, but rather the adhesive vapor retarder is applied in-line to the facing material just prior to the facing material being contacted to the fibrous layer. The facing material may be pre-perforated or may be perforated in-line during the facing process before the adhesive vapor retarder is applied. The facing material 40 may also include a visual line, preferably a dashed colored line (e.g., alternating 1/2 inch dashes and 1/2 inch gaps), over the perforations 42 to assist the installer in locating the perforations.

[0034] As shown in FIG. 4, the separation means may alternatively comprise an overlap area 44 of separate facing sheets 40a-d. In this embodiment, there is a separate facing sheet 400a-d, each attached to a respective layer section 28a-d. The facing sheets 400a-d each overlap an adjacent facing sheet along the length of the longitudinal cut 26. The facing sheets are preferably sealed together at the area of overlap to provide a continuous vapor retarder in circumstances where the layer is not separated at such overlap. (Alternatively the overlap area may be uncoated.) Preferably, the facing sheets which are adhered to the inner layer sections 400b-c are at least about one inch wider than the width of their respective layer section to provide a 1/4 – 1 inch, preferably about 1/2 inch section of facing sheet which overlaps the adjacent layer section, and permits overlapping and sealing together of adjacent facing sheets. (Where the overlap area is uncoated, preferably the overlap sections on both sides of the facing sheets 400b-c are about 1/4 inches.) The facing sheets on the outer layer sections 400a,d are preferably about 1 3/4 inches wider than their respective layer section to provide a 1/2 inch section of facing sheet (or 1/4 inch for uncoated overlap sections) which overlaps the adjacent layer section and a 1 1/4 inch section of facing sheet which extends from the outer side wall 32 of outer layer sections to provide a fastening tab or nailing hem 41. (Alternatively, where the tabs are a folded two-layer 1 1/4 inch section, the facing sheets, the facing sheet is 3 inches wider than its respective layer section.) Where the facing sheets do not include a fastening tab or nailing hem on the outer layer sections, the facing sheet is preferably only approximately 1/2 inch wider than the respective layer section. The facing sheets of the inner layer sections may also include an additional approximately 1 1/4 inch section (not shown) on the outer overlapping edge 43 to provide for a fastening tab when the layer sections are separated at the selected longitudinal cut. The fastening tab sections of the facing sheets are preferably folded over as shown in FIG. 4. Such folding of the tabs may occur in-line during the facing process or may be preformed in the roll of facing. In this embodiment having overlapping facing sheets, preferably the facing sheets are pre-coated with an adhesive, e.g., asphalt, rather than being coated in-line. To permit the overlapping areas of the pre-coated facing sheets to be separated easily by an installer, preferably water is applied in the form of spray or drops to the facing sheets at the sealed area of overlap to weaken the adhesive bond. Alternatively, the facing sheets may be uncoated on their rolls, and a temporary bonding adhesive may be applied to the edges of the

facing sheets of the inner layer sections (i.e., the areas of overlap) to hold the facing sheets together as they proceed across the adhesive (e.g., asphalt) coater and are laminated to the fibrous layer 20 (i.e., coated in-line).

[0035] As shown in FIG. 5, in another embodiment, the separation means may include a visual marking line 46 that extends along the facing and is aligned with the longitudinal cut. The visual marking line 46 allows an installer to quickly and efficiently cut the facing along the desired longitudinal cut 26.

[0036] Referring to FIGS. 6A and 6B, in another embodiment, the separation means includes an inner connecting strip 48 adhered to the layer 20. The connecting strip is preferably adhered to the layer 20 by an adhesive, such as, for example, asphalt, by pre-coating the connecting strip 48 on an inner surface 49. Preferably, the inner connecting strip is between about 1/4 and 1 3/4 inches in width, and extends substantially the length of the longitudinal cut 26. In this embodiment, separate facing sheets 140a-d are adjacent to one another but not overlapping. Rather, the facing sheets 140a-d overlap, and are adhered to, the connecting strip 48. At larger widths, the connecting strip is wide enough to provide a fastening tab once the layer sections are separated at the selected longitudinal cut.

[0037] Referring to FIG. 7, the separation means on the facing material of an alternative embodiment of an insulation blanket includes a fold or crease 50 in the facing material which is aligned with the longitudinal cut 26. Alternatively, the facing material may be scored along a line which is aligned with the longitudinal cut of the layer. The fold, crease or score line provides a line of weakness in the facing material which facilitates the separation of the facing material along such fold, crease or score line.

[0038] Referring to FIGS. 8A and 8B, the separation means on the facing material of an alternative embodiment of an insulation blanket includes a sealing fin 54. In this embodiment, each layer section has a separate facing sheet 51. A sealing fin 54 is aligned with each longitudinal cut 26 which separates the layer sections 28. The sealing fin 54 is formed by folding over upon itself an edge 56 of the facing sheet 51 of a layer section 28 and overlapping that folded edge 56 with the edge 55 of a facing sheet of an adjacent layer section. An adhesive

material 57, such as a hot melt glue or diluted starch preferably applied as a temporary adhesive, serves to adhere the overlapping facing sheets together. The adhesive may be applied in dots or stitches to the edges 55, 56, the amount and type varying depending on the type of facing material. The overlapping region of the facing material may provide a fastening tab when the facing sheets 51 are separated at the longitudinal cut 26. The sealing fin 54 may be preformed on the roll of facing material or folded in-line during the application of the facing to the fibrous layer sections. The edges 55, 56 of the sealing fin 51 may vary in width, and preferably are of sufficient width to provide fastening or stapling tabs when the layer sections are separated.

[0039] Referring to FIGS. 9A and 9B, the separation means of the facing material of an alternative embodiment of an insulation blanket includes a folded fin 58. This folded fin 58 is similar to the sealing fin 58 of FIG. 8A and 8B, with the difference being that there is no adhesive between the overlapping portions of the facing sheets to adhere the overlapping portions together.

[0040] Referring to FIGS. 10A and 10B, the separation means of the facing material of an alternative embodiment of an insulation blanket includes a crimp fold 60, which is aligned with each longitudinal cut 26 that separates the layer sections 28. Each layer section 28 has applied thereto a separate facing sheet 61. The crimp fold 60 is formed by folding one edge 62 of a first facing sheet 61a over the edge 64 of an adjacent second facing sheet 61b and thereafter folding over upon itself the edge 64 of the second facing sheet 61b. The overlapping region of the facing material may provide a fastening tab when the facing sheets are separated at the longitudinal cut 26. The crimp fold 60 may be prefolded on the roll of facing material or folded in-line during the application of the facing to the fibrous layer sections. The edges 62, 64 of the crimp fold 60 may vary in width, and preferably are of sufficient width to provide fastening or stapling tabs when the layer sections are separated. The crimp fold may be adhesive-free or alternatively include an adhesive. Where present, the adhesive material, such as a hot melt glue or diluted starch preferably applied as a temporary adhesive, may serve to adhere the overlapping facing sheets together. The adhesive may be applied in dots or stitches, for example, to edges 62 and/or 64, the amount and type varying depending on the type of facing material.

[0041] In each of the embodiments of the fibrous insulation blanket as described above, the facing material, or facing sheet(s), may include fastening tabs 41 (See FIG. 4) along the outside edges 32 of the blanket for securing the fibrous blanket to wall studs, floor joists, roof rafters, or the like. The fastening tabs 41 may be folded back as shown in FIG. 4 for ease in packaging, and then extended during installation to provide a nailing hem. Preferably the fastening tabs are approximately 1 1/4 inches in width. Although they may include only one layer, preferably, the fastening tabs are two-layers to provide increased strength. These fastening tabs may either be formed in-line during the facing process or may be preformed in the roll of facing. Alternatively, the fibrous insulation blanket embodiments may include facing material without fastening tabs.

[0042] In each of the embodiments of the fibrous insulation blanket, the facing material is adhered to the fibrous layer by an adhesive. In one embodiment of the invention, the adhesive is comprised of asphalt, which acts as a vapor retarder when coated on the kraft paper. An asphalt layer is applied in molten form to the facing material after which it is pressed against the fibrous layer before hardening to bond the facing material to the fibrous layer. Alternatively, the adhesive may include a different bituminous material or other preferably vapor retarding adhesive polymer.

[0043] As indicated above, the insulation blanket can have one or more longitudinal cuts 26 (and a corresponding number of separable means on the facing material) which allow the insulation blanket to be separated into two or more faced layer sections. The number of faced layer sections and the widths of such sections may vary depending on the application. Preferably, the total width of the insulation blanket is between about 15 inches to 15 1/4 inches, which is the preferred size for insulating standard size spacing between framing members of 14 1/2 inches. For faced blankets, preferably the total width of the insulation blanket is approximately 15 inches, but may also be 15 1/4 inches, for example. For insulating cavities between steel studs, the total width of the insulation blanket is preferably approximately 16 inches wide.

[0044] In one preferred embodiment, as shown in FIG. 1, the longitudinal cuts 26 separate the layer 20 (which is approximately 15 1/4 inches wide) into four layer sections 28a-d, having three layer sections 28b-d with a width of 3 3/4 inches and one layer section 28a having a width of 4 inches. In other preferred embodiments, a 15 inch layer may be separated into section of 6 inches, 2 inches, 3 inches, and 4 inches (which allows the layer to be separated (or unseparated) to widths of 2, 3, 4, 5, 6, 7, 8, 9, 11 and 15 inches); or 15 1/4 inch layer separated into three 4.25 inch sections and a 2.5 inch section (which allows the layer to be separated (or unseparated) to widths of 4 1/4, 6 3/4, 8 1/2, 11, 12 3/4, and 15 1/4 inches). Where the total width of the layer is 16 inches (such as for insulating between steel studs), preferably the layers sections are 3 1/2 inches, 4 1/4 inches, 4 1/4 inches and 4 inches. Preferably, but not necessarily, the sections are provided in the order stated.

[0045] In another preferred embodiment, the layer has only one longitudinal cut, which separates the layer into two layer sections. Where the layer has only two layer sections, preferably the layer includes one layer section having a width of 4 inches and the second layer section having a width of 11 1/4 inches, or alternatively, the layer includes one layer section having a width of 8 3/4 inches and the other layer section having a width of 6 1/2 inches. Where the insulation blanket is a 15" kraft faced product, preferably the layer includes one layer section having a width of 4" and the second layer section having a width of 11" or one layer section having a width of 9" and the second layer section having a width of 6". Where the total width of the layer is 16 inches (such as for insulating between steel studs), preferably the two layers sections are 11 inches and 5 inches, 10 inches and 6 inches, 9 inches and 7 inches, or 11 1/2 inches and 4 1/2 inches.

[0046] Another aspect of the invention is a method of making a separable insulation blanket 10. One exemplary method includes cutting a fibrous layer into separate layer sections by making at least one longitudinal cut that extends from a first major surface to a second major surface of the insulation blanket, applying an adhesive to inner sidewalls of the layer sections formed by the at least one longitudinal cut to glue the layer sections together, and applying a facing material to at least one major surface of the insulation blanket, wherein the facing material includes a separable means that is aligned with the at least one longitudinal cut.

[0047] The facing material may be pre-coated with adhesive or may alternatively be coated with adhesive just prior to bonding the facing material to the fibrous layer. For the embodiments employing separate facing sheets, preferably the facing sheets are pre-coated. Preferably, the edges of the facing sheets which are to overlap one another are sealed together with adhesive. In order to allow the overlapped edges to be separated easily by the installer, water may be applied in the form of spray or drops, for example, to the kraft paper side of the facing sheet at the area of overlap to weaken the adhesive bond. Where the facing material is not separated into separate facing sheets, e.g., where the separable means includes perforations or a single crease or score line, the facing material is preferably coated with adhesive in-line just prior to being adhered to the fibrous layer, but may alternatively be pre-coated.

[0048] In embodiments where the separate facing sheets are not pre-coated and are to be overlapping, preferably the facing sheets are unrolled from their payout strands, and a temporary bonding adhesive is applied to the overlapping region of the sheets to hold the sheets of facing together as they proceed across the asphalt coated and are laminated to the layer sections.

[0049] In forming the separable insulation blanket, the fibrous layer is fed through a cutting station where rotary saws or other cutting means separates the fibrous layer into individual layer sections. An adhesive is then applied to one or both of the inner side walls of adjacent layer sections to glue back together the layer sections. The fibrous layer is then fed into a facing station. At the facing station, the facing material, or separate facing sheets (preferably sealed together), is fed from a roll or rolls. An adhesive, such as asphalt, is applied to an upper surface of the facing material for bonding the facing material to a second major surface of the fibrous layer. The adhesive-coated upper surface of the facing material is then brought into contact with the second major surface of the fibrous layer with the separable means of the facing material aligned with the longitudinal cuts of the fibrous layer.

[0050] Although the invention has been described in terms of exemplary embodiments, it is not limited thereto. Rather, the appended claims should be construed broadly, to include other variants and embodiments of the invention, which may be made by those skilled in the art without departing from the scope and range of equivalents of the invention.